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AMERICAN JOURNAL OF OPTOMETRY

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BILATERAL CRYSTALLINE LENS DISPLACEMENT*

E. LeRoy Ryer, Opt.D., F.A.A.O.
and
Elmer E. Hotaling, Opt.D., F.A.A.O.
New York, N. Y.

At the age of four years Miss G. Mc.C. entered kindergarten and was made aware of low visual acuity. She is now seven and gets along reasonably well in school by being permitted to go to within three feet of the blackboard and to hold reading and writing matter four inches from her eyes. The subjective symptoms simulate those of high myopia.

Her parents consulted four oculists each of whom urged immediate operation in order to save not only vision but the eyeballs as well. Depressed and discouraged but not convinced sufficiently to act upon such advice, the parents refused to take further action until referred to Dr. Albert Sycher for optometric opinion and advice.

Being assured by the parents that the child would not be submitted to the operation urged he met the request to ascertain whether or not anything short of operation could be done to help; specifically, in the form of corrective lenses.

Dr. Sycher obtained sufficient improvement in visual acuity to warrant doing all that could be done along optometric lines and requested, inasmuch as the father made frequent trips to New York, N. Y., that we be taken into consultation in order, especially, that the possibilities of telescopic spectacles be exhaustively worked out.

We saw the child first September 12, 1932. She had been a normal birth except for queer look about eyes, although a previous child, the first born, had died at the seventh day due to faulty development of the spine, ending in spinal meningitis. Her tonsils had been removed eight months ago and she had had measles one year ago. Mentally above the average.

Each crystalline was found to be displaced outwardly so that its

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inner margin cut approximately through the middle of its pupillary foramen. Hand slit-lamp, ophthalmoscope and retinoscope disclosed no pathology. Hence it seemed to us that if the displacements were congenital all might remain inactive indefinitely; if traumatic, however, the prognosis could not be so hopeful. We dismissed traumatic origin upon the ground of inability to suggest any form of blow that could have caused one lens to go one way and the other the opposite way; for instance, a blow upon right side of skull might have torn zonula fibers of the left side of each eye which means, however, the inner side of the right eye and the outer of the left, permitting both lens to shift to the right or both may have been jolted to the left by a blow on the left side of the skull. It is barely possible, but not at all probable, that a blow on back or front of skull might have torn, evenly, the inner fibers of each zonula; the absence of any cloudiness of lens, any synechia, any floating cells or tissue seemed to justify our conclusion that the possibility of traumatic origin was too remote to consider a sufficient reason for withholding optometric aid or urging, as immediately imperative, surgical interference.

However we called Dr. G. Bonaccolto in consultation on this phase, knowing no more trustworthy slit-lamp investigator. He found cornea normal, no deposits on Decemet's membrane; anterior chamber normal depth; no cells floating; no Tyndall phenomenon; iris normal size, shape, color; no coloboma; pupillary foramen normal but iridodonesis easily elicited, the pupillary border not resting on the lens; each lens displaced laterally so that the nasal equator is in full view very close to the central pupillary area; in the nasal area are visible numerous fibers of the zonula of Zinn which form the periphery advance toward the central part of the lens to be inserted in the zonular lamella without causing any disturbance of the lens structure; these fibers are widely spread but not broken and seem to hold the lens in place preventing dangerous movements which might cause complete luxation; the lens itself does not show any other pathology or anomaly; no evidence of any other congenital anomaly.

The problem, with so much at stake, was still a serious one, limited somewhat by the decision of the parents to trust to optometric aid until the girl reached maturity when she could decide for herself whether or not she wished to risk operation to remove the lenses. We approached it from two angles, first as to what was known in general of such cases and, second, as to what of that applied to this particular case.

Such cases are rare, about one in five thousand. We could trace no heredity, although the condition is believed to show that tendency. In all varieties of coloboma supposed to be due to the late closure of the ocular fissure we find a failure of perfect development of the zonula fibers. The cause may be fluidity of the vitreous. It might be traumatic although history should usually determine this point. If the dislocated

lens is still partially in the pupillary area and transparent, either myopic astigmia or monolateral diplopia may be expected to ensue. The interference with vision then may be relieved partially or totally by corrective lenses.

If the lens be free to move, especially if it get into the anterior chamber, secondary glaucoma is almost sure to follow, when extraction, though always dangerous, becomes imperative.

Another source of possible irritation lies in the trembling of the iris, iridodonesis, with every movement of the eye, when deprived of the support of the crystalline lens.

If the pupil be large, as frequently in these cases it may be, a loosely hanging lens may slip back and forth through it and set up an iridocyclitis of serious degree. This tendency of a luxated or a subluxated lens to shift its position makes its extraction as difficult as its retention is dangerous; loss of vitreous is an ever-present menace in extraction.

When the zonula of Zinn is ruptured or incomplete and the lens luxated or displaced we must keep in mind that the lens then yields to its inherent elasticity and assumes its most convex form. Again the peripheral area then may be the part used by the eye in seeing in which case the effects of a high plus and a high prism must be expected.

If trouble follows the displacement of the crystalline lens it is usually of an extremely serious nature, yet operation is always serious too and cases are recorded wherein totally luxated lenses have remained clear and benign in the vitreous over four, eight and even thirty year periods. Thus a search of the literature helped little because statistically the evidence indicating and contraindicating surgical interference was too nearly balanced.

But the case under present consideration, while typical, possessed more of the typically favorable than the typically unfavorable features. Two fundus images were visible under indirect ophthalmoscopy, more marked in the right eye. Retinoscopy showed myopic shadow movement predominating over hyperopic. Subjectively plus 10.00 sphere gave the best visual acuity obtainable in the plus area but caused diplopia with its resultant confusion. Minus 12.00 sphere gave somewhat better visual acuity, caused diminution in the size of the projected images but did not cause diplopia, monocularly nor binocularly, and eliminated an apparent exotropia. Although ophthalmometry indicated a corneal astigmia with the rule of minus four diopters, no cylindrical was acceptable subjectively; a tilting of the crystalline lens upon a vertical axis, which is the way this lens naturally would have tilted, might account for the neutralization of this corneal astigmia. Be that as it may, the fact remains that O. U.-6.00 D. sphere was accepted without perceptible diminution in the size of images, without diplopia, and without disturbing judgment of distance.

We thought it incumbent that we prove if possible whether or not these displaced lenses moved freely or were held with reasonable firmness

by what fibers of the zonula did exist; we reasoned that the myopia should be reduced, if the lenses were free to move, as the head was bent forward, face down; the myopia was not reduced and we concluded that the lenses could not have dropped forward any appreciable amount and therefor that one element of danger was not present. The pupils were unusually small, yet while thus they insured against the danger of the lenses passing forward into the anterior chamber the irides could not have supported their weight as the head was held face down.

We decided to prescribe upon the following basis: The parents had decided definitely against operation and assured us that nothing that we or others could urge would alter that decision. Either plus or minus correction helped visual acuity in its respective area and eliminated monocular diplopia by blurring the other area respectively. Plus seemed to accentuate an already existing exotropia and cause diplopia, binocularly of course; minus gave slightly better visual acuity results and eliminated all diplopia. Dr. Sycher's results corroborated ours in every essential. Dr. Bonaccolto's exhaustive slit-lamp examination corroborated our results and conclusions in every essential.

O. U.-6.00 D. sphere were prescribed for constant use, with instructions to avoid all play or work that might tend to jar the crystalline lenses loose; to have Dr. Sycher make monthly observations; to have comparative slit-lamp check tests made at reasonably frequent periods, three to six months apart; and to see us annually, with Dr. Sychers' acquiescence, as interested consultants.

One month later father reported, "G. now holds reading at normal distance, no longer at four inches; sits in seat at school and sees blackboard work; cried when glasses were first put on because she feared they attracted attention to a condition of which she was already self-conscious, but now objects to their removal even to be cleaned; no pain; no stumbling; no doubt but that child is improved."

Discounting this rationalization all we wish, we think under the circumstances, it is well that the child was given the benefit of optometric treatment.

An interesting and instructing sidelight was the spontaneous expression of gratitude by the parents who intimated that Dr. Sycher and we were the only ones of those consulted who appeared to take any but a cold-blooded view of the case. Be that as it may, we wish to draw the conclusion that optometry and ophthalmology can work together to the benefit of the patient in many cases, as they did in this, provided the optometrist take what we find the very necessary precaution of selecting ophthalmologists, some of whom exist, who will cooperate wholeheartedly and squarely.

DRS. E. LEROY RYER AND ELMER E. HOTALING
NINE EAST FORTY-SIXTH STREET
NEW YORK CITY

FOCAL INFECTION DIAGNOSED BY CHROMAGRAPHOLOGY*

Donald J. Mayer, Opt.D.
Riverside, Calif.

If endogenous or exogenous toxemia is present in any case under optometric care, whether the case be one requiring orthoptic or corrective treatment or a straight refractive case, the patient will receive only a part of the benefit that he should derive and in many cases optometric help is very doubtful.

Chromagraphic evidence is of indispensable value to the Optometrist who specializes in diagnostic and corrective optometry. Dr. T. A. Brombach, of the University of California, states, "Optometric interpretation of color fields will take the place that X-Ray analysis occupies in dentistry."

My friend, Dr. W. E. Kessinger, retired baby specialist, whose work in the elimination of toxemia in the treatment of the diseases of children is quite widely known, often has said, "The laboratory is a potent factor in the solution of all scientific matters, but the final analysis is made in the crucible of the clinic."

Chromagraphic evidence has been proved to be of indispensable value, and the crucible of the clinic has enhanced its importance as a part of every complete optometric diagnosis.

Dr. Brombach states, "Proper optometric hygiene consists in elimination of the causative agent of improper physiological function of the human eye before preventive or corrective measures are prescribed."

If there is any toxemia present in the body of an amount in excess of that which the chemical forces of the body can neutralize and therefore tolerate, this toxemia will be shown to be present in the charting of the fields of color vision.

Chromagraphology is the only means of diagnosis which gives us evidence of an intolerance of the body toward a toxic agent whether the toxic agent be introduced from without (exogenous toxemia) or created from within (endogenous toxemia).

As this causative toxic agent is eliminated, by chromagraphology, the continual improvement and the return to normality of the patient

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can be recorded. Normal fields of color vision consistently recorded several times over a period of seventy-two hours, or more, show the eyes to be toxic free or give evidence that any existing toxemia is tolerated by the body, and the resistant ability of the patient toward toxemia is great.

The most virulent type of toxemia is that endogenous toxemia of focal origin. Dr. Heather's definition of this type is, "Focal infection exists when we have a circumscribed area of pus which may or may not have drainage."

This paper deals with focal infection as diagnosed by chromagraphology. It is my object not to give a comprehensive study involving the physiological principles, etc., of chromagraphology but to show its clinical value in the practice of optometry.

For a comprehensive study of the principles and practice of chromagraphology, I would refer the reader to the works of Dr. T. A. Brombach and Dr. Harry A. Fuog.

In presenting the following clinical cases, let us remember that focal infection, being the most virulent type of toxemia, the effect on the fields of color vision is that of a general contraction of all the fields with the greater restriction of the green field. If we could chart the case of focal infection in its very first stages, we would find that the green field enlarges before it undergoes contraction. Likewise, as the source of trouble is removed, it goes back through the stimulative type of chromagraph and then assumes the normal or expected normal chart.

This is difficult to clinically demonstrate because the Optometrist receives the case after this enlarging of the field has taken place, and the case invariably shows a definite focal infection. On the other hand, cases that would progress to focal infection are many times corrected through optometric hygiene.

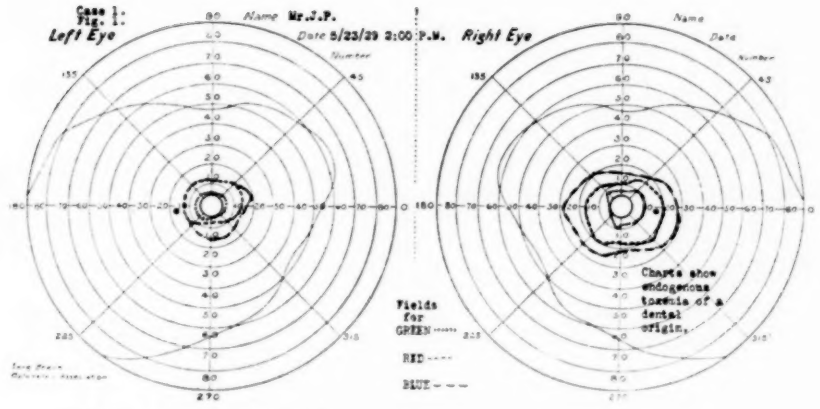
My colleague in chromagraphic investigation, Dr. Keith Walker, has clinically followed the case of focal infection through the above-mentioned stages. From the beginning of our clinical investigations, both Dr. Keith Walker and myself have had the wholehearted cooperation of several fine dentists, and it has been exceedingly interesting and helpful to have had the cooperation of Dr. F. L. Householder, Dental Surgeon.

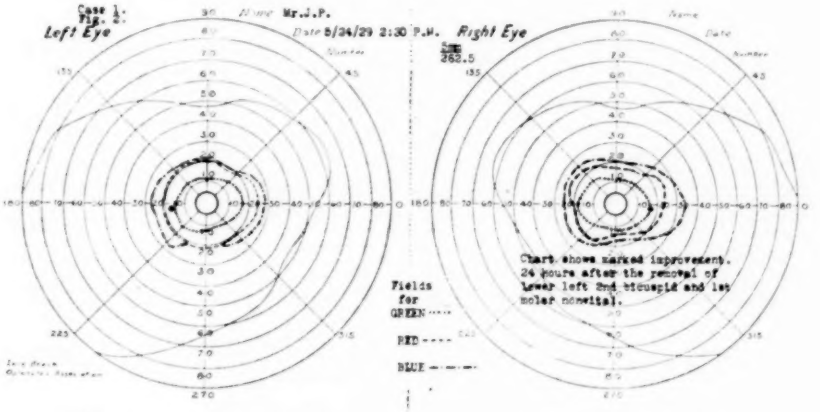
In considering clinical cases of focal infection as diagnosed by chromagraphic evidence, those first discussed are of dental origin.

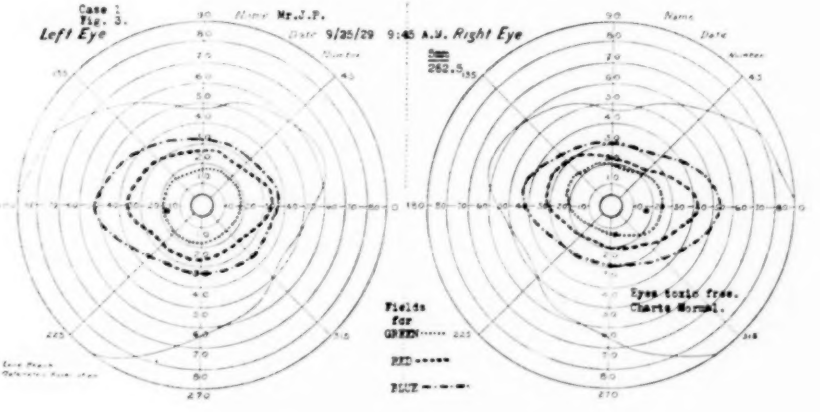
Dental Cases

Case One. Patient, Mr. J. P. Age 64 years.

Case History: Patient came in with a history of ocular trouble extending over a period of twelve years. He had his eyes examined and new lenses prescribed each year during that time, but after two or three months following the prescribing of the new glasses his old symptoms always returned. These symptoms were a dull pain in the eyes and front part of the head after reading and an inability to see clearly at distance or near.


Case 1:
Fig. 1:
Left Eye
Name Mr.J.P.
Date 5/23/29 2:00 P.M.
Right Eye
Charts show endogenous toxemia of a dental origin.
Fields for
GREEN
RED
BLUE


Case 1:
Fig. 2:
Left Eye
Name Mr.J.P.
Date 5/24/29 2:30 P.M.
Right Eye
Sum
262.5
Chart shows marked improvement. 24 hours after the removal of Lower left 2nd bicuspid and 1st molar nonvital.
Fields for
GREEN
RED
BLUE


Case 1
Fig. 3.
Left Eye
Name Mr.J.P.
Date 5/25/29 9:45 A.M.
Right Eye
Sum
262.5
Eyes toxic free. Charts Normal.
Fields for
GREEN
RED
BLUE

The patient had 20/40 vision in each eye. Both ocular and palpebral conjunctivae were inflamed. The ductions showed a very poor reversion to fusion of both lateral and vertical muscles and 1¼ prism diopters of right hyperphoria at infinity with 1 degree of right hyperphoria at near. The various prescriptions will not be given as none of them disclosed a radical change, and my prescription was similar with a normal increase for near work made up in bifocals.

The chromagraphs consistently gave evidence of a focal infection. The accompanying diagram (Case 1, Fig. 1) reveals a locked infection in the chromagraph of the right eye and a drainage type of infection in the chromagraph of the left eye. Patient had a history of never having been ill a day in his life. He was free from constipation or other abdominal trouble.

I found the sinuses all clear by trans-illumination and the throat in a fine condition. The examination of the patient revealed possible dental infection, and I referred him to the dental surgeon for complete examination with full mouth X-Ray.

Dr. Householder's report to me was as follows: "Regarding Mr. J. P., X-Ray shows lower left second bicuspid and first molar non-vital and marked rarification at apices of roots. Both teeth were removed and sockets curetted."

The second chromagraphs (Case 1, Fig. 2) taken twenty-four hours after this dental work was done show in the chart of the right eye a marked improvement by the enlarging of the green field. The chart of the left eye shows an enlargement of all fields.

This is the usual case, not the unusual one, for the very best authorities in dental surgery we have in this country, Dr. Edward C. Rosenow, of the Mayo Clinic, Dr. R. L. Hayden, of the University of Kansas, and Dr. Carl D. Lucus, of Los Angeles, have definitely proved by the combined research of their individual practices that in 94.6 per cent of all cases of devitalized teeth, actual pathology exists of the focal infection type. Some dental authorities find this percentage higher. Therefore, in chromagraphology, if the case shows focal infection, we expect a marked improvement after the removal of non-vital teeth provided the case is of dental origin and the percentage indicates that it will be.

Dr. Lucus also finds that in the great majority of cases of people having ulcers of the stomach and actual heart lesions, there are non-vital teeth, old tooth roots, or granuloma. The removal and curettement of these pathological dental conditions invariably improve the health of the patient. This further opens the field of research to the Optometrist doing work in chromagraphology.

The third set of chromagraphs (Case 1, Fig. 3) made three months after the removal of the non-vital teeth of Mr. J. P. show the eyes to be toxic free. The patient at this time had much better vision with or without glasses. The ductions were near the expected normal, and the vertical

phoria had entirely disappeared. The patient stated that his eyes were very comfortable.

A check examination one year later showed the eyes to be functioning normally and at that time the patient stated that he was having more ocular comfort than he had had for the past twelve years. Without the aid of chromagraphology, this patient, within a few months after I had prescribed lenses for him, would have gone to another eye practitioner and would have placed my glasses "among his souveniers."

After a period of a little over two years, the patient again called for re-examination and at that time new lenses were prescribed. His eyes had changed as we had expected, due to his age, and a set of chromagraphs showed the eyes to be toxic free as the charts were very near the theoretrical norm.

Case Two. Patient, Mr. D. Age 55 years.

Case History: Patient came to me because he was near-sighted and was gradually becoming more so, so he thought, and wanted corrective work done to dispense with the wearing of his glasses.

I found the media of the crystalline lenses hazy. Venous congestion at discs. Blood pressure 160 to 165 Systolic. Esophoria at infinity 2.5 prism diopters. Physiological Exo 1 prism diopter. Induction and plus convergence high, but all other ductions near the expected normal. The sinuses were clear, the throat normal, but seventeen remaining teeth were affected with pyorrhea.

Patient's vision was 20/40 O. U. uncorrected but 20/20 O. U. with the prescription he was wearing for distant vision (minus 1.00 plus .50 axis 180 O. U.). Ophthalmometric evidence negative, but balance of my objective examination showed patient to be slightly myopic.

Chromagraphic records gave evidence of focal infection of dental origin. These chromagraphs were made at 9:00 A. M. The charts showed the green fields of both eyes to be within the 10 degree circle at about 5 degrees. The red fields of both eyes were right at the 10 degree circle with the temporal parts of the fields extending to about 12 or 15 degrees. The blue interlaced with the red fields and were well within 15 degrees with a limit of 18 degrees to the temporal sides. The next set of charts were made at 4:10 P. M., the following day. The second set of charts confirmed the diagnosis and showed the focal infection to be of drainage type. These charts were very similar to the first ones, but with smaller blue fields.

The patient was using some wine or alcoholic stimulant, smoking six to nine cigars and drinking three or four cups of coffee daily. This was discontinued for forty hours, and the third set of charts showed the condition to be the same, the only variance in these charts being more reduced green fields with a little less interlacing of the blue fields.

This case was referred to the dental surgeon and the charts taken after the removal of three teeth. This set of charts showed quite an

improvement. The green fields enlarged to about 15 degrees. The red fields enlarged to about 18 degrees in the vertical, temporal about 22 degrees, and nasalward about 20 degrees. The blue fields interlaced with the red, but some of the blue appeared on the outside of the red fields. After the remaining teeth were removed, charts were taken in the morning and in the evening which showed the eyes to be toxic free for the charts were normal. These charts were made about ten days after the removal of the remaining fourteen teeth. One month later the charts were again taken showing further enlargement. This final set of charts showed the blue fields to extend temporal 46 degrees, downward 30 degrees, upward 28 degrees, and nasalward 35 degrees. The dental surgeon's report to me stated that there remained one impacted third molar to be extracted at a later time.

The chromagraphs now show the tolerance of the patient to be so high that the same amount of stimulant and this impacted third molar are not at the present time causing any toxemia that the body cannot neutralize. The patient was treated with base-in orthoptic procedure on the Kratometer and Squint Korector (Peckman's). He now uses glasses for near work only, as his vision is 20/20 each eye and 20/16 O. U. without glasses. Blood pressure is now 135 mm. Systolic. The crystalline lens of each eye is clear and the veins show no congestion.

Many times this question is asked by the patient or by students first taking up the study of chromagraphology: "If there is more than one source of infection so that the focii are located in different parts of the body, which source of infection is the one causing the trouble?" The answer by the optometric diagnostician is, "It matters little which source is giving the most trouble as the infection must be eliminated or reduced until tolerance is reached."

The following case is an illustration of the above statement:

Case Three. Patient, Mrs. G. K. Age 48 years.

Case History: Chronic constipation over a period of eight years; arthritis of several years standing, as diagnosed by her physician; Fibroid Tumors, revealed by X-Ray; serious liver disturbances, for which she had been treated fifteen years; and a severe dental condition of which the patient was well aware. Any one of these conditions might be a focal infection; or, more likely, a combination of all conditions making the chromagraphs appear to show a very definite endogenous toxemia. Patient complained of eyes tiring, and that they were very sensitive to both artificial and sunlight. In addition to this she was extremely nervous.

My examination of the patient revealed a low amount of myopia combined with a very poor muscular tonicity. Exophoria at infinity 1.5 prism Diopters, Physiological Orthophoria at 14 inches. The sinuses and throat were normal.

I shall give neither her former nor my bifocal prescriptions which

was badly needed. My correction could not have possibly given comfort had I not with the aid of chromagraphology diagnosed the focal infection which was causing the most trouble.

The first chromagraphs were taken at 4:35 P. M., and showed an endogenous toxemia of focal origin. The green fields were within the 10 degree circle. The red fields extended in the vertical to about 15 degrees and in the horizontal to about 18 degrees. The blue fields were immediately within the red fields. Charts made the next morning at 8:45 A. M., confirmed the diagnosis of focal infection and the chart of the right eye showed some of the blue field to be on the outside of the red field, although the fields interlaced. Fatigue set in so quickly that the chart made of the left eye appeared very much the same as the preceding chart made the previous afternoon. Let us remember the Fibroid Tumors, the dental condition, or possibly the severe type of liver disturbance might be causing the focii of infection.

In all cases of people thirty-five years of age or more showing a focal infection as diagnosed by chromagraphology, we expect the infection to be of dental origin: that is, it is more likely to be of dental origin than of any other cause, for at their age resistance is lowered by natural metabolic changes.

I referred the patient to Dr. Householder for full-mouth X-Ray and dental diagnosis. His report was as follows: "Regarding Mrs. G. K., lower right second molar badly broken down and marked rarefied area of roots. Lower right second bicuspid non-vital with excementosis of apex. Upper right molar non-vital and root involvement. These teeth were extracted and sockets curetted."

Ten days after this dental surgery was completed, the chromagraphs were taken and normal charts were recorded. The sizes of these charts were similar with the blue fields upward 30 degrees, downward 35 degrees, temporal 50 degrees, and nasalward 35 degrees. The red fields were upward 23 degrees, downward 26 degrees, temporal 38 degrees, and nasalward 25 degrees. The green fields were upward 18 degrees, downward 18 degrees, temporal 25 degrees, and nasalward 18 degrees.

At the present time her tolerance to any existing toxic agent is such that the arthritis seems greatly improved and the liver condition appears to be better. She is not nervous, nor do her eyes tire easily.

Here again we have removed a cause of toxemia so that any existing toxic agent in her body is not at present causing trouble that normally cannot be tolerated.

The first examination, the dental and the optometrical work, was completed in September, 1930; in September of 1932 the patient called for re-examination. A new prescription was given to her and the chromagraphs taken as a part of the examination. These chromagraphs varied but little from the last charts made in 1930 which showed the eyes to be toxic free and the charts normal. The ocular condition of the patient's eyes was very much improved over the period of two years, and her

general health is very much better than formerly.

Mention should be made of the modern methods of periodontia and prophylaxis as practiced by the stomatologist in the correction of pyorrhea. To illustrate this work, we shall use the following case:

Case Four. Patient, Mrs. H. Age 67 years.

The chromagraphs showed an endogenous toxemia of dental origin. The green field of the right eye was within the 10 degree circle in the vertical and extended to about 12 degrees in the horizontal. While the green field in the left eye was entirely within the 10 degree circle, the red fields were near the expected normal and the blue fields interlaced with the red fields.

This case was referred to the stomatologist for complete oral examination, and the dental diagnosis was a marked pyorrhetic condition throughout the mouth. The bone structure of the patient's mouth was quite dense; therefore she responded to treatment for the pyorrhea as though she were thirty years younger. The chromagraphs were made at intervals during this prophylactic treatment and showed a continual improvement, being an enlargement of the green fields and an enlargement of the blue fields until by the time the case was released by the dental specialist, the charts showed the expected normal. The patient's eyes during the early part of the treatment for pyorrhea showed a hazy condition of the crystalline lenses. This haziness of the lens media cleared entirely within a few months after the case was released by the stomatologist. The left eye was amblyopic, and the amblyopic treatment brought her vision in that eye to 20/25.

This fairly well covers the field of focal infection of dental origin. Although the cases of dental origin are of the greatest importance of all endogenous toxemias, for there are more of them, and after the removal of the toxic agent, it is not only easier to chart improvement to illustrate to the patient, but the results to the patient are so pleasing that he realizes that optometric examination or procedure is far superior to any other method of ocular attention.

During my four-year investigation of the value of chromagraphic evidence in optometry, several hundred cases of endogenous toxemias came under my observation, and the chromagraphic evidence in practically all of these cases was confirmed. I found that the majority of these cases of endogenous toxemia were of dental origin. In the solution or follow-through work of these cases of dental focal infection, I had the cooperation of seven very competent and ethical dentists; two of whom are dental surgeons. It is a pleasure to report that in every dental case followed through the results were very gratifying, although at times more than one dental investigation and many times three or four investigations were required before the source of trouble was eliminated.

Tonsilar Cases

The second type of cases showing focii of infection and second in

importance to the Optometrist are cases of tonsilar origin. We would suspect the tonsils rather than the teeth to be the source of infection in all patients under thirty years of age, and our chromagraphic evidence followed through confirms this statement. The throat lamps and various other instruments aid the Optometrist or surgeon in telling whether or not the tonsils appear bad, but only by the aid of chromagraphology can it be determined whether or not a tonsillectomy is advisable and necessary. I shall outline three cases to illustrate this type of focal infection.

Case Five. Patient, H. C. Age 18 years.

Case History: Patient came to me five years ago to have his eyes straightened. He had convergent strabismus. The actual measurements of the lateral imbalance gave 12 prism diopters of tropia (Esotropia) with a right hyperphoria of 6 diopters. This patient's eyes were straightened by orthoptic treatment and the prescribing of glasses.

From time to time his prescription was changed and occasionally his eyes were treated for several weeks at a time. In June, 1929, the patient came in with the complaint that he was seeing double and was afraid his eyes were again becoming crossed.

My examination confirmed his fear, for I found he was very much worse. At this time he had 8 prism diopters of Esophoria and 4 prism diopters of right hyperphoria at infinity and an occasional diplopia.

The chromagraphs showed focal infection (Case 5, Fig. 1), and due to the patient's age, I did not suspect dental trouble; nevertheless, complete dental diagnosis was made and the report was negative. The chart of the right eye showed the locked type of infection while the chart of the left eye showed the drainage type.

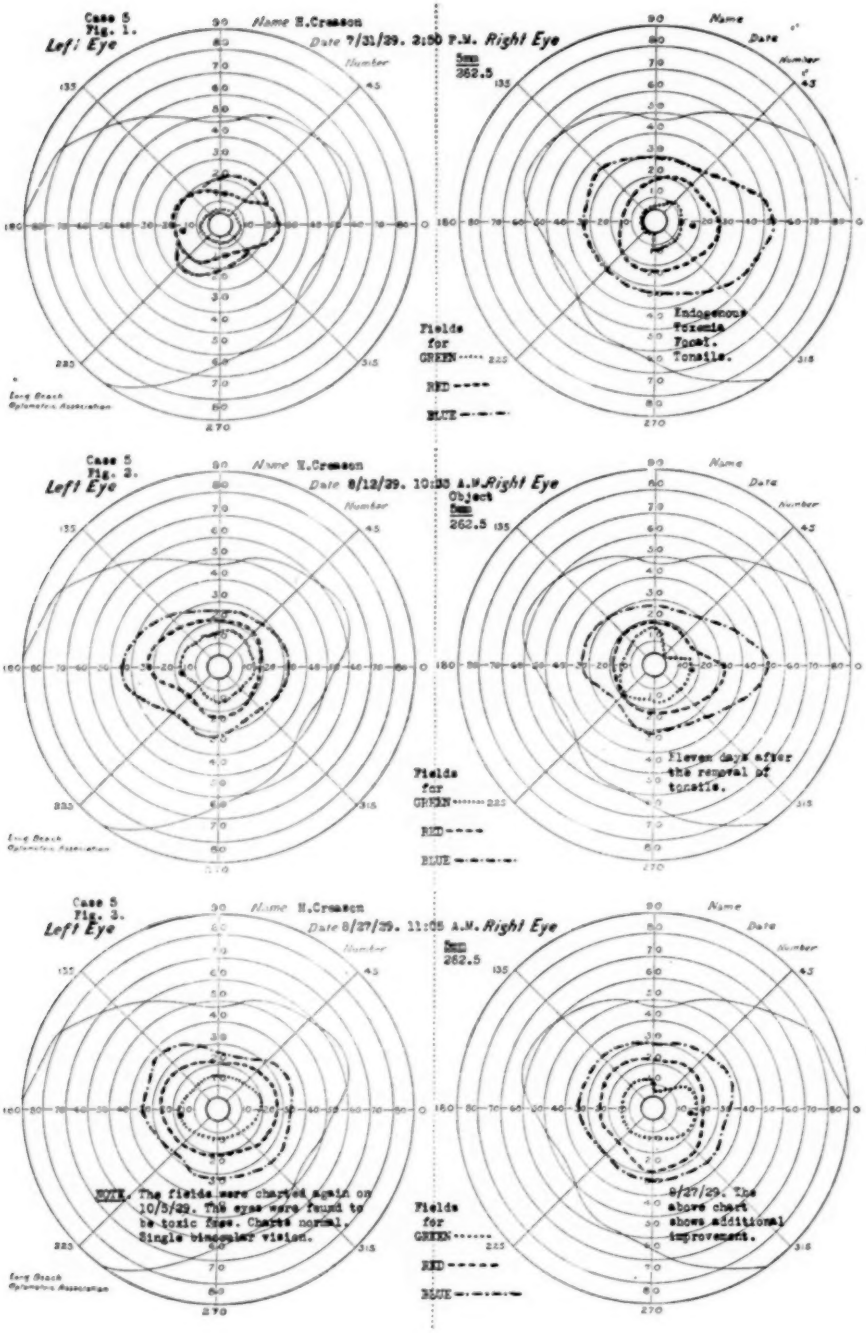
I found the sinuses clear and no history of nasal or sinus trouble. Upon examination of his throat, I found his tonsils greatly enlarged and infected so advised the removal of them.

The next set of charts made eleven days after the tonsillectomy showed a very marked improvement in his toxic condition (Case 5, Fig. 2). It is of interest to note here the peculiar change in the chromagraph of the right eye.

In Case 5, Fig. 1, note the quadrant missing in the green field, the lower quadrant on the 225th meridian. In the second chromagraph (Case 5, Fig. 2) note the quadrant is missing, but this time in the upper part of the same meridian (45th).

The third set of chromagraphs (Case 5, Fig. 3) show this defect in the green field to be disappearing and a later set of charts showed the eyes to be toxic free and the fields normal. The green field of the right eye is not quite regular.

The patient at the time the final set of chromagraphs were made had singular binocular vision, 2 prism diopters of esophoria and 2


Case 5
Fig. 1.
Left Eye
Name H.Crossen
Date 7/31/29. 2:50 P.M.
Right Eye
5mm
262.5
Number
Endogenous
Toxemia
Tonsils.
Fields
for
GREEN
RED
BLUE
Long Beach
Optometric Association
Case 5
Fig. 2.
Left Eye
Name H.Crossen
Date 8/12/29. 10:35 A.M.
Right Eye
Object
5mm
262.5
Eleven days after
the removal of
tonsils.
Fields
for
GREEN
RED
BLUE
Case 5
Fig. 3.
Left Eye
Name H.Crossen
Date 8/27/29. 11:05 A.M.
Right Eye
5mm
262.5
NOTE. The fields were charted again on
10/3/29. The eyes were found to
be toxic free. Charts normal.
Single binocular vision.
8/27/29. The
above chart
shows additional
improvement.
Fields
for
GREEN
RED
BLUE

prism diopters of right hyperphoria. In December, 1930, a complete examination of the patient was made, and the eyes were found to have greatly improved over the year's time.

First of September, 1932, this patient's eyes were re-examined and due to the periodical orthoptic training, the eyes were still further improved and a set of chromagraphs which were near the expected normal showed his tolerance or resistance to be high.

Case Six. Patient, Mrs. J. Z. Age 25 years.

Case History: Patient complained of feeling tired physically and eyes hurting most of the time. She felt sleepy and had pain over her eyes.

The refractive condition of her eyes revealed a low hyperopic and low astigmatic condition, certainly not enough of an error to cause the trouble of which the patient complained. The muscular system showed a low or poor tonicity but nothing greatly at fault.

The chromagraphic evidence indicated focal infection, and as the patient had heard of my work in chromagraphology and was leaving town for a few days, suggested that she go without stimulants (coffee, tea, cigarettes, etc.,) until she could come in again some few days later.

Eight days later our chromagraphic evidence still indicated focii of infection unchanged by absence of stimulation. Careful examination of the patient's mouth was made; and while her teeth and mouth appeared to be perfect, a full-mouth X-Ray was insisted upon which confirmed my diagnosis of an absence of trouble from that possible source. Examination of her throat revealed one infected tonsil; therefore I advised a tonsillectomy. One week after the operation the chromagraphs were made and gave evidence that the condition was much the same, for the throat during the first week was in a very much inflamed state. Twelve days after the removal of her tonsils, the chromagraphs gave evidence of a toxic free condition of her eyes and showed the expected normal type of chart.

The patient's eyes feel comfortable, the physical tiredness has disappeared, and the temporary prescription (glasses) has been discarded after being worn but six months.

The next case which I shall describe reveals the accumulated effects of toxemia of tonsilar origin over a period of many years.

Case Seven. Patient, Mr. C. H. S. Age 70 years.

Case History: Patient called for ocular attention and gave a case history of not having had ocular comfort for many years. This patient had very high blood pressure (198 mm. Systolic) and an extremely low tonicity of the ocular muscles. The chromagraphs gave the blue fields very near the expected normal. The red fields constricted and the green field of the right eye was only the size of a pencil dot. In other words, moving the green target away from the center fixation, color completely

disappeared. The chart of the left eye differed inasmuch as the green field was a definite streak on the 135-315 meridian. This streak extended to about 5 degrees from the fixation point and was no wider than a heavy pencil mark. The patient had a history of throat and tonsil trouble of many years standing and had had quinsy five times, the throat and tonsils being lanced each time. The patient was referred for manipulative spinal therapy, and his blood pressure was reduced 35 mm. By an occasional manipulative treatment his blood pressure is being held at about 160 mm. Systolic. At the patient's age it was not advisable to perform a tonsillectomy. Whenever the patient's blood pressure increases, he has a great deal of ocular disturbance. At the present time the case is under control.

I believe that these three tonsilar cases clinically demonstrate the necessity of including the chromagraphic examination in all optometric diagnoses.

Sinus Infection

Clinical analysis indicates that sinus infection is of far less importance than dental and tonsil infection. It is very hard to follow the sinus case through its various stages of improvement, because of its low response to treatment and due to the length of time taken in its cure. The patient does not report for chromagraphic examination because of a loss of enthusiasm which is natural as the color fields enlarge slowly and the real significance of periodic examination is lost to him.

In my files I have records of cases of sinus infection in which chromagraphology has played a large part in my diagnoses, but there are very few cases of sinus infection that I have followed through to the elimination of the toxic agent.

It is of interest to note here one case. That of an elderly man who had sinusitis over a period of thirty-five years. The sinuses infected were the maxillary and sphenoidal. The chromagraphs showed all the fields (blue, red, and green) to be within the 5 degree circle, the green field being no more than a heavy pencil dot in size. The physician to whom I referred this case reported that at the patient's age (seventy-five) little or no improvement could be expected. By some local medical treatment and my prescription with some base-in prism, the patient is quite well satisfied.

Recently one of my patients called for re-examination, complaining that his vision blurred slightly at distance and at times he noticed this same blur at near work. From the examination I found his eyes in every way were near the expected normal, and there was no reason for the blurr from the standpoint of refractive or muscular disturbances.

In order that any change in the patient's resistance might be observed, the chromagraphs were taken in the morning and again in the evening of the same day which positively revealed focal infection. I again took the chromagraphs twice on the following day which confirmed my

diagnosis and found proof that the infection to be the drainage type.

The patient had his tonsils removed a little over a year ago; his throat was clear. The left maxillary sinus was very cloudy as compared to the right maxillary. He had a chronic nasal catarrah of several years standing. To localize the infection, we eliminated the possibility of any dental disturbance by full mouth X-Ray and oral diagnosis and then referred the patient to a nose and throat specialist who confirmed my diagnosis of left maxillary sinusitis. The physician advised operation immediately, but the patient's eyes are now a little better, so he is postponing the surgical intervention.

This is true of the majority of sinus cases. The ocular manifestations are of such a transit nature that it is hard to make the patient realize that immediate care is necessary in order to clear the sinus condition and eliminate ocular disturbance.

Focal Infection of Abdominal Origin

If a group of ten or more Optometrists using chromagraphology daily in their practices were to assemble to classify the various types of focii of infection and place them in the order of their importance, it would be difficult for them to agree on the position of importance that focal infection of intestinal origin should have. W. E. Kessinger, M.D., many times has said, "The alimentary tract is a reservoir and laboratory of poison with which one must acquaint himself if he hopes for success." Dr. Kessinger is here speaking of any diagnostician or any practitioner doing work in hygiene and diet.

Many of our modern authorities have found that the entire intestinal tract is the original seat of the majority of all cases of focii of infection. One of our members of the profession, Dr. J. H. Drakeford, of New York, has spent some time in study and research along this line of work and the report of his investigations is published in the February, 1931, issue of The American Journal of Optometry.

I firmly believe that if the intestinal tract is kept thoroughly cleansed then it ceases to be a reservoir of poison and in that way the resistance of the body is greatly increased, making it indeed difficult for any toxic agent to gradually become a source of focal infection.

Clinical evidence in chromagraphology reveals this fact: That if the green and red fields are somewhere near the expected normal and the blue field is small or a part of it is missing, then the toxemia is of intestinal origin. In this type of chart, the green field may be of normal size or it may be constricted, but the red is always near the expected normal with the blue contracted or a part of it missing. Many cases charted over a period of three years or more reveal this fact that the blue field contracts in the vertical meridian first in all abdominal toxemia of intestinal origin.

This type of chromagraph appears to be evident that unless the patient follows a strict hygienic program the accumulation of toxic

poison will eventually cause a focal infection.

This type of case responds very quickly and a marked improvement in the chromagraphs will invariably be recorded in a period of four to twenty hours if the hygienic advice given by the Optometrist, or the physician to whom the case is referred, is carefully followed by the patient.

Dr. Walker and myself have both noted from our individual practices that many cases in which the chromagraphs showed fairly normal red fields with normal or small green fields and blue fields that were constricted in the vertical meridians or partly missing, later revealed practically normal sets of charts within a few hours after the intestinal tract had been cleansed by enemas. I also have records on file of cases of this type in which the chromagraphs have assumed normality after a short cleansing fast. A case of appendictis that responded quickly to manipulative and hygienic therapy illustrates this statement.

A patient whose eyes I had treated and corrected with lenses the preceding year and who lives in a nearby town came in the office one day to call on me. He said that he had been suffering from an acute attack of appendicitis diagnosed by several doctors and that while he had been unable to come downtown two days previous he could now go to the doctor's office for treatment.

Further questioning revealed the following information: The patient was being treated by a very competent chiropractor. The treatment consisted of fruit juice fast (eight glasses of fruit juice and eight glasses of water daily) colonic irrigations daily (a special table and equipment is used in colonic irrigation, from nine to twelve gallons of water flow through the intestinal tract and colon but at no time is there more than one-half pint of water in the colon) and straight manipulative treatment. This treatment was given him for eight days. I made a series of six chromagraphic records for him during the time this treatment was being taken.

The first two sets of chromagraphs gave evidence of a focal infection of a severe drainage type. The green fields were greatly constricted, the red fields were somewhat small, and the entire blue fields were almost entirely absent. Each set of chromagraphs after the first two showed a marked improvement over charts previously taken. The results obtained by the sixth set of chromagraphs gave positive evidence of tolerance to any existing toxic agent or that the causative toxic agent had been removed, for the charts were normal.

The patient was given advice to have a rather serious dental condition corrected, which he did. There has been no recurring attack of appendicitis, and the patient is taking better hygienic care of himself than ever before.

I shall outline one more case, this one showing the effect of diet in a case of endogenous toxemia of abdominal origin.

In June, 1929, a case was referred to me for ocular attention, the patient being the sister of one of the outstanding surgeons (M.D.) of this part of southern California.

The patient, Mrs. S., could read only a few minutes at a time before her eyes pained her severely. The duration of this trouble had been over a period of about two or three months.

Examination showed that a slight change of lenses were needed, and the ductions showed an extremely low reversion to fusion. During the objective examination, the patient suffered greatly from photophobia and her eyes lacrimated badly.

The chromagraphic examinations resulted in a diagnosis of endogenous toxemia of the focal infection type, probably of abdominal origin. The patient was given a prescription for lenses and sent to her brother for general diagnosis. A report from the doctor stated that Mrs. S. was suffering from Mucus Colitis, and that proper treatment would be instituted at once.

Mrs. S. responded nicely to treatment, and her eyes improved greatly as her health improved. In June of 1930 Mrs. S. came to me for further ocular attention. At that time there seemed to be a return of former ocular symptoms.

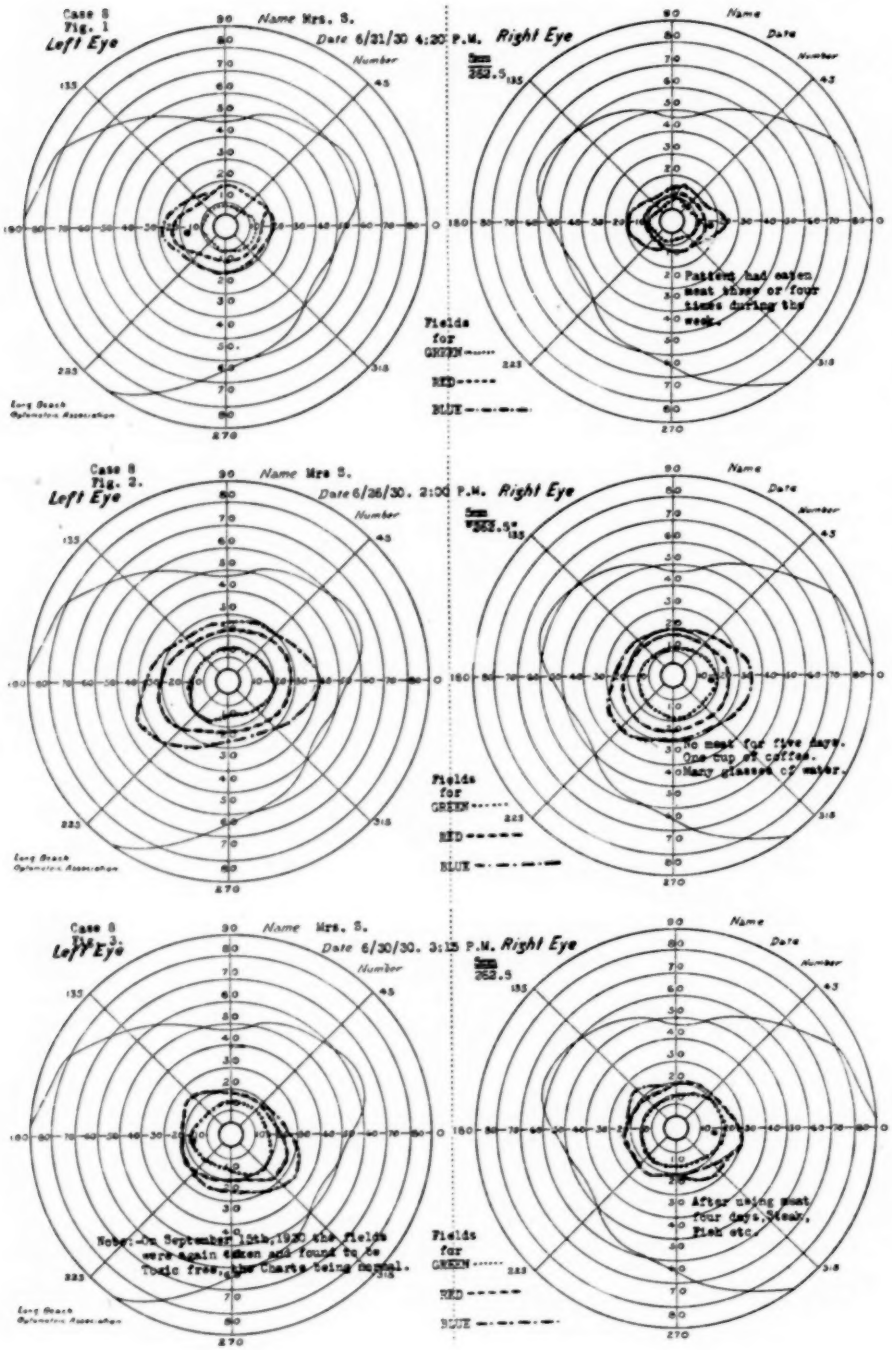
Examination revealed some change in the ocular condition over a year's time. The muscular system again was in bad condition, showing esophoria and a low induction. Both induction and plus convergence gave findings of a very poor reversion to fusion.

Chromagraphic examination revealed a focal infection (Case 8, Fig. 1) more severe even than that present the year before. Then the patient confessed that because of putrefaction, she had been advised against eating meat, fish, fowl, and eggs, but that she had been eating these types of food forbidden by her brother in the diet he had outlined for her.

I then advised Mrs. S. to go without meat for five days. These instructions were followed and five days later the chromagraphs were almost normal (Case 8, Fig. 2). To demonstrate to the patient that she must follow her diet more closely, she was allowed to eat meat for four days after which time the charts were taken (Case 8, Fig. 3). This third set of chromagraphs showed intestinal toxemia, and if the same regimen had been followed a while longer, the charts would have reverted back to the focal infection type as the first set of chromagraphs (Case 8, Fig. 1) indicated.

After following her diet as outlined and not eating meat, etc., the fourth set of chromagraphs made about two and one-half months later showed the eyes to be toxic free.

The condition of the patient's eyes depends entirely upon her state of health. At times her eyes feel very comfortable and at those times the chromagraphic evidence is negative. At other times when her eyes bother


Case 8
Fig. 1
Left Eye
Name Mrs. S.
Date 6/21/30 4:20 P.M.
Right Eye
Patient had eaten meat three or four times during the week.
Fields for
GREEN
RED
BLUE
Case 8
Fig. 2.
Left Eye
Name Mrs S.
Date 6/26/30. 2:00 P.M.
Right Eye
No meat for five days.
One cup of coffee.
Many glasses of water.
Case 8
Fig. 3.
Left Eye
Name Mrs. S.
Date 6/30/30. 3:15 P.M.
Right Eye
After using meat four days, Steak, Fish etc.
Note:-On September 12th, 1930 the fields were again taken and found to be Toxic free, the charts being normal.

greatly, the chromagraphic evidence indicates that the Mucus Colitis is beyond control.

Other tests were made on this patient for tolerance or intolerance to certain kinds of food (such as corn on the cob), but meat was the only food that seemed to greatly disagree with her.

Ocular examination of Mrs. S. made in August of 1932 showed her eyes to be greatly improved and the Mucus Colitis controlled by following a rigid diet.

Other records of cases on file of focal infection of abdominal origin in which chromagraphology has played an important part in my diagnoses are listed as follows:

1. Catarrah of the Uterus. In this case the chromagraphs were followed through showing improvement as the patient was being treated by the physician.
2. Catarrah of the Bladder. Several cases are on file, but only one has been followed through by chromagraphology.
3. Infection of Kidney (proper). None of these cases have been followed through the readjustment of the color fields.
4. Syphilis. Because of the lack of interest shown by several patients, no follow-through work was attempted.

Conclusion

Chromagraphology has successfully withstood the most severe tests of all, those made in the crucible of the clinic, and it demands its place as a part of every complete optometric diagnosis. Because of its frequency, the recognition of focal infection plays a large part in optometric diagnosis: and chromagraphology makes the diagnosis of focal infection positive.

Differential diagnosis is used throughout an optometric examination; but after the presence of focal infection has been determined by chromagraphology, diagnosis is made by exclusion. Copies of X-Ray, Urinalysis, and all other laboratory tests should be kept on file with ocular records and chromagraphs. These reports coming from the physicians, dentists, diagnosticians, laboratory technicians and surgeons confirm optometric diagnoses and enhance the value of chromagraphology.

While the patient is being treated by whatever type of therapeutic or surgical measures employed for relief, the case is under optometric control and definite evidence of improvement is recorded by chromagraphology.

If chromagraphology reveals evidence of endogenous toxemia, orthoptic procedure should not be instituted unless the patient is responding nicely to the therapeutical measures employed. The great majority of cases of focii of infection do respond quickly to treatment or surgery so the prognoses by the Optometrist are good.

Chromagraphology is not theory; it is a clinical actuality.

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SENILE CATARACT AND ANTI-ACTINIC GLASS*

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Patient a woman aged 70 years, first seen by writer in 1929. The left eye was blind and the right showed lenticular opacities in an advanced state. She had been advised by two ophthalmologists to wait until surgical attention could be given.

It was felt that something could be done for the seeing eye. Vision without lenses was 10%, with plus sphero-cylindrical correction became 33%. The correction was given ground up in a white anti-actinic glass and the patient advised to keep in contact with the practitioner. Medical attention was given to bowels and kidneys which were found to have defective functions. A saline draught being administered when required. One month later the V.A. was 50%, six months later 66% and when last seen it was equal to 95% with the lens opacities only very slightly visible. The above case prompts a few reflections. No other treatment was given other than an accurate correction of the refractive error, found after a careful retinoscopy (static and dynamic), given in a lens that would cut out the Ultra-Violet, coupled with skilled medical attention. We do not know the exact origin of senile cataract, but we do know that it occurs when the vital forces of the system are on the ebb. Careful examination clearly reveals that it is accompanied by abnormal conditions of the stomach, intestines and kidneys. Perhaps it is caused in the following manner: the toxic products of the abnormal processes invade the blood stream and ultimately obtain an entrance into the lenticular apparatus where they are capable of being influenced by the chemically activating Ultra-Violet light, and so producing the manifest opacification of the lens.

Two cases of senile cataract recently seen by the writer were subjected to extensive examination: one aged 68 proved to have renal calculi and the other, who showed an intense chronic condition in the stomach ring of the iris, gave a history of past and present stomach ulceration. Both are being watched with interest and may be reported on later.

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ON THE USE OF A STRONG BASE-OUT PRISM TO ASSIST THE EXAMINER IN VIEWING THE FUNDUS IN AN OPHTHALMOSCOPIC EXAMINATION*

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I believe that the macular area is the most difficult part of the fundus to view. Not that it is hard to see, but because the observer's head obstructs the patient's view of the fixing target just about the time you reach the macula. The patient tries to see around the observer's head and moves the macula away out of view before it is reached.

We have all noticed how easy it is to view the macula of an exotrope. With a standard technic we find that our primary position gives us an easy view of the disc. In the case of an exotrope the out-turning eye places the disc nasalward and we find the macula occupying the usual position of the disc. This permits an easy view of the macula without getting into the line of fixation of the patient.

Then it follows that we want the normal patient to turn the observed eye outward and still permit us to keep out of his fixing line.

Here is how it is done: Use about a 30 degree plano prism (a 20 and a 10 can be cemented together if you do not have a 30). To view the right eye: the patient takes the 30 degree prism between the thumb and finger of the left hand and holds it base-out before the left eye. Your head is in front of his right eye for observation, so the fixation target is seen by the left eye only. The prism displaces the apparent position of the target to the right causing both eyes to turn to the right. This places the right macula in the primary position, at approximately the point where the disc usually appears. You are out of his fixing line and the macula is right in front, you don't have to hunt for it, you couldn't miss it.

The macular area should be viewed in every case, even though the acuity is good and no lesion is suspected. By this practice you will keep yourself trained in locating the area and having viewed hundreds of normal ones you will be more capable of detecting the abnormal. It is advised that the illumination be only brilliant enough to observe detail and the area to be observed as quickly as possible, so as not to create a light scotoma temporarily.

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DEVELOPING THE LIGHT BAND IN ASTIGMATISM*

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Among the several signs of astigmatism shown by retinoscopy the appearance of a light band has long held a prominent place. When distinct this is a definite sign of astigmatism and is mainly of use in determining the axis. However, it is not often that the light band appears in such distinct form that definite dependence can be placed on it. It was shown long ago by Dr. Jackson and others that the band is most distinct when the examiner is at the point of neutralization of one meridian and the light source is at the far point of the other, the relatively defective meridian.

A working mental picture of the focusing process can be obtained by assuming, for example, that the vertical meridian is neutralized at 26 inches (66 cm.), the horizontal meridian still shows a "with" movement because it is focused, for instance, for infinity. Using a luminous plane mirror retinoscope, the bulb so set that the light leaving the mirror is parallel, this light is sharply focused by the horizontal meridian of the examined eye. In the vertical meridian the light is over-converged as this meridian having been neutralized at 26 inches (66 cm.) is 1.50 diopters myopic. The retinal image of each objective light point is a short vertical line and the whole vertical light band here is most distinct.

It would seem at first thought that the usefulness of the light band could be increased by the application of a movable light source. At the stage of neutralization of one meridian the light source could be so shifted until the light band was most distinct. At that point the light source would be at the far point of the meridian still to be neutralized. Such an arrangement could be most easily obtained mechanically with a luminous retinoscope. By slightly shifting the position of the bulb or the condensing lens the virtual light source could easily be placed at any desired distance. In practice, however, the value of such a movable arrangement is very limited and hardly worth the trouble. For a working distance of 26 inches (66 cm.) a fixed position of the virtual light source

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13 inches (33 cm.) behind the mirror seems about the best arrangement. The light leaving the mirror with a divergence of 3 diopters, reaches the patient with a divergence of one diopter. Such an arrangement can be easily obtained with a luminous retinoscope.

A few illustrations will show the limitations involved in shifting the light source. Suppose we found at 26 inch (66 cm.) working distance a "with" movement in all directions and that after we neutralized the vertical or approximately vertical meridian with a plus 2.00 sphere, the horizontal meridian still showed "with" motion. This meridian is now in focus either for parallel light, far point at infinity, for convergent light, far point negative, or for divergent light of less than 1.50 diopter divergence, far point beyond 26 inches. If it is in focus for parallel light, the light band will be most distinct when the virtual light source is placed at infinity. But as soon as a plus cylinder is inserted for neutralization purposes, for example, a plus .50, the best position for the virtual light source is no longer infinity. It is now at 80 inches (2m.). The next cylinder inserted will again require a shift in the position of the virtual light source. If, in the illustration, the horizontal meridian is focused for convergent or slightly divergent light, similar considerations hold true in that each plus cylinder interposed necessitates a new position of the virtual light source in order to place it at the far point of the defective meridian.

A feasible application would be to shift the light source only once at the beginning of the examination when the astigmia is at its highest, in order to determine the direction of the light band and thereby the axis position. Cylinders may then be placed with the axis in this determined position without further reference to the light band. The limitation even of this procedure is that it can be applied only in cases where plus cylinders are used. Where minus cylinders are used to neutralize an "against" motion, the far point of the defective meridian is in front of the mirror and only the use of a concave mirror can place the light source there. As minus cylinders are often used in retinoscopy the use of a movable light source would through this factor alone be of little practical value.

A fixed virtual light source 13 inches (33 cm.) behind the mirror and therefore 40 inches (1 cm.) from the patient seems a good general arrangement for the reason that when neutralization is obtained in one meridian, for example the vertical and the horizontal meridian still shows "with" motion, the clearness of the light band will be at its maximum when the error is .50 diopter relative to the distance of the examiner. Of course the band now, because of the small error, is broad and diffused. If the error is higher than .50 diopter, the light band will be indistinct because the light source is then not at the far point of the defective meridian, but it will be more concentrated because of the higher error. With the interposition of plus cylinders for neutralization purposes, the light band should gain in clearness of direction, because the far point

of the defective meridian is brought closer to the position of the virtual light source. This also holds true in the far more important case of using minus cylinders. The interposition of neutralizing cylinders brings the far point closer to the position of the virtual light source and thus tends to produce a more sharply defined light band.

On the whole, however, the exact position of the cylinder axis in retinoscopy can only with difficulty be determined through the light-band. The application of cylinder retinoscopy lends itself better for such work, especially where no reliance can be placed on the subjective verification. In fact, the application of more than one objective method for locating the axis is called for in such case.

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A STUDY OF THE ASSOCIATION OF THE VERTICALS AND OBLIQUE EXTRINSIC OCULAR MUSCLES WITH CONVERGENCE AND ACCOMMODATION

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Since it has been observed through the years that in taking the phorias the normal patient shows an average of from four to six diopters more exophoria at the reading distance than at far, it has become the custom to think and talk of this additional exophoria for near as physiological exophoria, or a normal condition to be expected.

In taking the Phorias with our Phoropter, Phorometer or Kratometer, the near Phoria must be taken on a level, or a nearly level position with the eyes. Few, if any, of our patients read or do their near work with their eyes in this position, all or nearly all, hold their reading matter at a lower position.

Since it has been observed that the eyes during sleep turn out and upward, it seemed reasonable to assume, since they turn inward to approximately parallelism as they come down to the line of vision, that possibly there was an association of the Verticals and Obliques with the Convergence, that would eliminate part or all of the so-called Physiological Exophoria when the eyes were in the reading position. Experimenting with such prisms as were available on a few patients it seemed this hypothesis would prove true, at least we received enough encouragement to construct special equipment to accurately take the near phorias in the normal reading position.

Our next problem was to locate just how low the average patient held their reading: this was found to be about 35 degrees or 50 prism diopters.

We were now confronted with the problem of equipment sufficiently accurate for our investigations: two solutions presented themselves: Prisms and Mirrors; we decided to use both: so we mounted a pair of 50 diopter prisms in aluminum cups that fit the back of our phoropter: Mirrors were also mounted and used in the same manner.

With the Prisms there was some distortion and Chromatic aberration to contend with. The mirrors on the other hand gave a clear distinct image that enabled one to read .50 Jaeger type nicely. The two instru-

*Submitted for publication October 20, 1932

ments gave the same Phoria findings, the Chromatic aberration of the Prisms having no apparent effect.

We now had equipment in which we were confident the findings could be depended on and have been since this time taking our near phorias, in the regular manner and then in the reading position. The writer then compared the results.

Tabulating these results we found:

In 67% the physiological exophoria decreased a noticeable amount.

In 21% the physiological exophoria increased.

In 12% of the cases there was no change in the Phorias.

We therefore found 67% of all cases conforming to our hypotheses. Of these 37% took up all or more than the total physiological exophoria as measured with the phoropter. The remaining 63% ranged from one to four diopter less than shown by the phoria test in the ordinary position. In the 21% of all cases that showed an increased exophoria at the reading position 8% showed an increase of 5 diopters, an equal number an increase of 4 diopters, 16% increased 3 diopters, 24% two diopters and 44% one diopter.

We found in some cases where the exophoria increased through the prisms, that if we brought the reading position still lower we got the usual decrease in exophoria. Some few cases of high physiological exophoria were esophores in the reading position, so we are lead to question the diagnostic value of a high or low physiological exophoria taken in the usual manner.

Since we have seen in our previous experiments that in 67% of our cases the exophoria decreased in the reading position it was the natural thing to enquire "What occurred to accommodation?" when the eyes were brought to the lower level.

We found we could get fairly satisfactory dynamic skiametric findings in the vertical meridian through the 50 diopter base-up prisms (in moving the Retinoscope in the horizontal meridian), and that these findings agreed in most cases with the Cross-Cylinder findings with the eyes in the same position.

So finding that the phorias as taken with the Base-up prisms, agreed with the phorias taken with the Mirrors we discarded the mirrors from our procedure: as it was most difficult to take the Dynamic findings with them. The Ductions could also be taken with the Base-up prisms. Now we were fairly well equipped to study the Association of the Vertical and Obliques in their association with Convergence Acommodation as we could take, Phorias, Ductions, Dynamic Skiametry, Cross Cylinder findings and the Subjective reading tests as well as the near point findings. The Cross Cylinder findings were taken with the target mounted on a rod that could be held at just the 35 degree inclination. The reading card was also held on this same rod. For this work the

correction was mounted in the regular trial frame and the lines equalized to correct the marginal astigmatism introduced by looking through the flat lenses away from their center. Then the cross cylinders placed in position and the test made.

Less Plus for near, in the lower reading position, if there were a fairly close association of the Verticals and Obliques with Accommodation would be the expected, just as less exophoria would be expected if there were a fairly close association with the Convergence function. We found 38% of our patients required less plus for the reading position and all of these showed less exophoria.

Comparing this with the findings of 67% less exophoria would seem to indicate that while roughly one-third of our cases could be expected to have a fairly close association of the Vertical and Obliques with accommodation, two-thirds of them showed a fairly close association with the Convergence.

In amounts, the plus decreased from a quarter to a full diopter, fully enough to be considered an important factor in fitting bifocals. The plus remained the same in 38% of the cases tabulated: but in these cases the phoria findings did not follow the accommodation findings as they did where the plus decreased. In 35% the phorias remained the same. In 20% the exophoria increased and in 45% there was the normal expected decrease in exophoria. In 20% of this class there was no change in ductions.

More plus was indicated in 24% of the cases tabulated, here again the convergence association did not agree with the accommodation association, as 7% showed no change in the phorias, 28% showed an increase of the exophoria and 65% the normal expected decrease in the exophoria.

Considering the subject from the viewpoint of age, the presbyopic group represented just 30% of the total number of cases, of these 55% took less plus in the reading position of the eyes and 90% of these showed a decrease in their exophoria. In 10% the exophoria increased. The presbyopes taking the same amount of plus in either position were 28% of these, exophoria decreased (as expected) in 40%, increased in 60%. More plus in the reading position was indicated in 17% of this age group and 66% of them showed an increase of exophoria at the reading position, while 34% showed the normal expected decrease in exophoria.

	All Cases	Presbyopes	Pre-presbyopes
Less Plus in reading position of eyes	38%	55%	21%
Same Plus in reading position as level	38%	28%	42%
More Plus in reading position	24%	17%	37%

From the above table it would appear that there was a definite association of the Verticals and Obliques with Accommodation as shown by the 21% of the Pre-presbyopes accepting less plus in the reading position, and that this association increases with age as 55% of the presbyopes

show the need of less plus in the reading position than with the target level with the eyes.

Analysis of the Association of the Vertical and Obliques with Convergence

	All Cases	Presbyopes	Pre-presbyopes
Physiological Exophotia decreases in reading position	72%	69%	75%
Physiologal Exophoria remains same	8%	none	10%
Physiologal Exophoria increase	20%	31%	15%

From the two tables it is easily seen that the association of the "Verticals and Obliques" is much closer with convergence than with accommodation.

We can easily see why this should be true: from the earliest development of man, thousands of years before the general use of reading or writing, thousands of years before man took much of any interest in things close enough to him to require any effort of accommodation, it was necessary for him to converge, whenever he looked downwards, so we have the inheritance of a brain pattern of a close association between the vertical and oblique with Convergence.

The clear distinct vision for near, and a consequent finely developed accommodation, has been a necessity for the past comparatively few years, and we do not have the inheritance of hundreds of generations of ancestors who exercised this function enough to give us an inherited Brain Pattern of the association of the Verticals and Obliques with accommodation. Perhaps if this same investigation were conducted with students whose progenitors were students we might find a much closer association with accommodation than we have with average run of patients in a farming community.

Continuing our study of that group whose exophoria increased in the reading position represented by 31% of the presbyopes and 15% of the pre-presbyopes, we find:

	Presbyopes	Pre-presbyopes
Less Plus was indicated in the reading position	none	none
Same Plus required in reading position	75%	40%
More Plus required in reading position	25%	60%

Now let us analyze those cases where the phoria was the same in the reading position as when taken on a level with the eyes. All of these were under the presbyopic age and 25% indicated the need of more plus in the reading position. 75% took the same plus in the reading position.

Cases where less plus was indicated in the reading position, all showed less physiological exophoria regardless of age.

Cases where less plus was indicated in reading position the same as when eyes were level:

	Presbyopes	Pre-presbyopes
Physiological Exophoria decreased in reading position	60%	62%
Physiological Exophoria remained same	none	25%

Physiological Exophoria increased	40%	13%

Of the 24% of all cases tabulated, accepting more plus in the reading position 15% were presbyopes and 85% were pre-presbyopes.

	Presbyopes	Pre-presbyopes
These showing less physiological exophoria in reading position, were	50%	73%
Those showing same physiological exophoria in reading position were	none	9%
Those showing greater physiological exophoria in reading position were	50%	18%

In the reading position the ductions normally decreased as follows:

	Decrease	Increase	No Change
Adduction	75%	15%	10%
Adduction recovery	75%	15%	10%
Abduction	82%	2%	16%
Abduction recovery	83%	10%	7%

Now turning to those cases showing a very strong association of the verticals and obliques with convergence function we find that, of those cases showing an increased *adduction:*

20% accepted more Plus in reading position.
40% accepted same Plus in reading position.
40% accepted less Plus in reading position.
40% had a greater Physiological Exophoria.
60% had a smaller Physiological Exophoria.

Cases exhibiting greater *abduction:*

100% accepted the same plus in the reading position.
40% had a greater Physiological Exophoria.
40% had the same Physiological Exophoria.
20% had a smaller Physiological Exophoria.

With this added information we can diagnose and correct many of our problem cases.

Many presbyopes especially can be more intelligently handled, especially if these are high exophores whose exophoria decreases as the eyes are brought downward. Then it would be correct procedure to use either full reading lenses or bifocals with base-up prism effect, small segs if the distance correction is high plus or monocentrics. This agrees with Peckham's practice to use monocentrics in high exophoria and would fill the needs of 69% of the cases of this type tabulated.

Should the exophoria increase as we have found that it does in 31% of our cases tabulated, then it is quite evident that we do not want to increase an already troublesome condition, so it would be in order to use bifocals, with a strong base-down effect, such as the Ultex A., or full vision lenses with fairly strong base-down prisms. Should we find cases where there was no change in the phorias at different reading position then we could use any type of bifocal or full reading lenses with perfect safety.

Naturally the amount of plus found in the reading position should be the reading correction since it is in this position that reading is to be done. That this may vary as much as a full diopter from the plus indicated in the horizontal has been borne out in several cases within the past year. If your patient really requires less plus in this position then we have the complaint of the necessity of holding the work too close, if more plus is really indicated in the lower position then we would still have a dissatisfied patient if he were fitted with his correction found in the horizontal. With the pre-presbyopes we sometimes find our investigation in the reading position reveals their real trouble that remained concealed in the horizontal tests. As an example I will cite the following cases:

School girl of eighteen complaining of pain in back of eyes and temples after reading, difficult to apply herself to studies: Normal Phorias, ductions, blur-points and uncorrected vision. Corneal Curves also normal, Static Skiametry Plus 0.50 D. Sph. O. U. Normal Dynamic lag. Subjective findings, Plus 0.50 D. Sph. O. U. agreeing with the Static findings. Normal Cross Cylinder Lag. So far a clear case, but on taking our ductions with this correction in place we find both abduction and adduction less than without lenses. Clearly lenses were not indicated as Peckham has shown why our patient will not accept lenses with comfort that cut down the ductions.

Investigation in the reading position we found, *4 diopters more exophoria* than in the horizontal. Also *¼ diopter more plus by Dynamic Skiametry;* our abduction break higher, but the adduction break much less than in the horizontal and the recovery nil as we had to use base-in prisms of 6 diopters to fuse the images. This was a case of normally developed convergence accommodation in the horizontal but sadly underdeveloped in the normal reading position. Building up convergence accommodation made the patient comfortable.

A second illustrative case. Patient wearing correction but uncomfortable, all conditions normal for distance and near in the horizontal, but in the reading position we found *1.25 D. less plus with Dynamic Skiametry*, 2 diopters of esophoria instead of the normal physiological exophoria found in the horizontal, adduction and recovery high but abduction and recovery very low, clearly a case of Hypertonicity of both convergence and accommodation. Base-in repression treatments made this patient comfortable.

At the present writing it would seem that there was as much to be gained from the study of the association of the verticals and obliques with convergence accommodation as there is through the study of the association of convergence accommodation.

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REFRACTIONS MADE AT THE BEDSIDE

The writer is frequently called upon to refract invalids who are either bedridden or who are at least unable to leave their homes. These patients are therefore unable to visit the office. Making such refractions naturally involves certain changes in refractive technics made necessary by the very nature of the work and the place in which it must needs be done. It has been suggested that a review of my procedure in refractive work of this character would be of interest and with this in mind I have prepared the following, which outlines the refractive steps taken during the bedside refraction.

In the first place all equipment to be used must be portable. This naturally eliminates the use of Refracting Units, Ophthalmometers, Rotary Arc Perimeters, Campimeters and similar large pieces of diagnostic equipment. The equipment which can be used must, aside from being portable, also be simple to handle inasmuch as the work must be done speedily so as not to tire the patient. I have therefore first prepared a simple list of the equipment I have used in making these house-calls for home refractions. The list contains everything I have found of value in doing this work during the past ten years, and is an exact inventory of the refracting accessories I take with me in making these calls. The list is as follows:

(1) Portable Trial Case and Test Lenses.

(2) Case History and Record Chart.
(3) Folding Visual Acuity Chart, with ties to hang on wall.
(4) Electric Cord handle Retinoscope.
(5) Electric Cord handle Ophthalmoscope.
(6) Electric Hand Slit-Lamp, with cord handle.
(7) Rheostat.
(8) Electric Extension Cord with Plugs.
(9) Two Trial Frames.
(10) Binocular Loupe.
(11) Head Mirror.
(12) Cross Cylinders.
(13) Ryer Interpupillary Gauge.
(14) 16 meter steel tape for measuring distance to chart.
(15) Near-point reading Test folder.
(16) Near-point centimeter tape.
(17) Rule.
(18) Several pliers.

Upon arriving at the sick room the first few moments are spent in getting acquainted with the patient and putting the family as much at ease as possible. While one is getting acquainted one can size up the illumination and possibilities for successfully making the refraction. Using a bedside table, I next unpack my equipment, using the steel tape to measure the distance from the patient to the far distant wall upon which the folding test chart is hung in the best possible light.

The extension cord is then attached to some convenient socket and the rheostat attached. The trial case is opened and the various pieces of diagnostic and refractive equipment are laid out at hand. The writer next takes the Case History and makes a record of the correction now in use by the patient. This ends what might be termed the preliminary refractive steps.

After washing up, the refraction itself begins. I usually start this with the external ocular inspection using the head-mirror where illumination permits or the binocular loupe, and in every case the hand slit lamp. Next an ophthalmoscopic examination is made followed by a static skiametric check of the patient's distance vision. Following this a simple subjective test is made, care being taken not to prolong this unduly as this is apt to tire the patient if too drawn out.

Following the recording of the patient's distance formula a dynamic skiametric test is made and after making proper allowances a subjective binocular near point test is made. This is followed by a near point monocular comparison test and when possible a cross cylinder check test, at the patient's near point reading distance. This distance is carefully measured with a tape as it is very important for the comfort of the patient to have this near point focus at the most convenient distance for the patient's reading. The formula to be prescribed is then recorded and

compared with the old correction. In the event that the old correction can be improved the new prescription is prescribed and the patient's interpupillary distance taken along with whatever facial measurements are necessary for the new material to be worn. C. C. K.

* * * * *

REVERSAL POINTS IN DYNAMIC SKIAMETRY

The technic of arriving at a point of reversal or a point of neutralization in Dynamic Skiametry differs somewhat from the same procedure when the skiametric test is carried on with fixation at six meters under static conditions. In dynamic skiametry as a rule several or in some instances a series of lenses are found, all of which produce a point of reversal or neutralization. The lowest powered lens and the highest powered lens being termed the low neutral lens and the high neutral lens. Between the two might be termed the reversal or neutral range.

According to Pascal, the low neutral lens represents accommodative insufficiency; the neutral range of lenses shows either accommodative inefficiency or negative relative accommodation, depending upon the size of type used in the fixation object. When large type or large characters are used in the fixation object the high neutral lens represents the strongest lens aid necessary to bring accommodation and convergence into a comfortable physiological adjustment. When small type or small characters are used in the fixation object the high neutral lens represents the maximum value of the negative relative accommodation at the distance that the fixation object is held from the patient and the test is made. These various values are at times of diagnostic value when the findings of other objective and subjective tests are at variance. C. C. K.

* * * * *

MONOCULAR PROGRESSIVE MYOPIA

In discussing the etiology and treatment of cases of monocular progressive myopia we find the theory of excessive convergence, naturally untenable. These cases of emmetropia in one eye and high myopia in the other are by no means uncommon and from time to time cases of this character develop to a serious degree. Nesfield believes that the defective myopic eye is suffering from glaucoma which causes the coats of the eye to stretch similar to buphthalmos. He maintains, moreover, that glaucoma is due to a swelling of the vitreous and not to a blocking of the filtration angle, and claims also that the shallow anterior chamber is but a cause of the swollen vitreous. In this regard perhaps Nesfield's theory is applicable to these cases of monocular progressive myopia since the degree of enlargement which the eye at times reaches is very obvious, the exophthalmos being noticeable even to laymen.

One method of correction of this monocular progressive myopia is, of course, surgical. The operator removing the crystaline lens, thus re-

lieving the pressure and at the same time reducing the myopia. This procedure is to be advocated only as a last resort however, and in most cases if the tension is normal an improvement in visual acuity can be secured by means of lenses. This is particularly true in cases that have been neglected. Swann suggests giving a full correction to the myopic eye and a slight fog to the good eye in the attempt to change the dominancy and encourage the myopic eye to function. He claims to have used this procedure in a number of cases, in none of which was the myopia observed to progress from this point on. C. C. K.

BOOK NOTICES

INJURIES OF THE EYE. Second Edition. Harry Vanderbilt Wurdemann, M.D. Published by the C. V. Mosby Co., 3523-3525 Pine Boulevard, St. Louis, Mo. 900 pages, 236 illustrations and 10 color plates. Cloth. $13.50. 1932.

Forty-two years of practical ophthalmological experience in a large manufacturing center is the basis upon which Wurdemann presents this second and enlarged edition on the treatment of ocular injuries. This is an exhaustive work dealing with every conceivable type of injury, each presented in a most complete manner.

Chapters 1, 5, 15, 29 and 33 hold, in the writer's belief, the greatest interest for the optometrist. Chapter 1 deals with general types of ocular injuries. Chapter 5 with various complications and their after effects frequently met with, by optometrists. Chapter 15 deals in a large measure with the use and fitting of artificial eyes. Chapter 29 deals with Traumatic Disturbances of the Motility of the Eye and Chapter 33 deals with the Determination of the Relation to and Amount of Economic Damage resulting from Injuries to the Eyes and Vision. In this chapter the writer discusses the Magnus and Wurdemann method of estimating mathematically the amount of economic damage suffered by the patient who has been injured. This is of value in adjusting visual compensation cases and is somewhat similar to the procedure suggested by Scott Sterling several years ago. The writer, however, found the Sterling method somewhat simpler than that suggested by Wurdemann and Magnus, though not perhaps quite so accurate.

Some twenty-five pages are devoted to a digest of the Workmen's Compensation Laws of the World in which the important facts of each State and each Country's compensation laws are reviewed. This 900 page volume presents the subject from a practical clinical standpoint and makes a splendid optometric reference book. C. C. K.

* * * * *

VISION AND COLOR VISION, R. A. Houstoun, M.A., D.Sc., Longmans, Green Company, 55 Fifth Avenue, New York, New York. 238 pages, 100 illustrations. $4.50. 1932.

In this book on Vision and Color Vision, Dr. Houstoun, a lec-

turer on physical optics in the University of Glasgow, has recorded the results of many experiments on this subject which he has carried on in that institution during the last twenty years. He also gives an account of some very interesting work on the subject done by others, the results of which had not up to this time been published.

In the first two chapters the author discusses the different kinds of units for measuring light and the discrimination of intensity. The next three chapters deal with dark adaptation, acuity of vision and the visibility of the spectrum. Three chapters are devoted to recurrent vision, fatigue and simultaneous contrast. In the remaining six chapters are described the laws of color mixing, color vision and color blindness. The author takes particular pains to give a very complete review of the different theories of color blindness and discusses the merits and shortcomings of each theory.

While the book was written primarily for the physists, physiologists and psychologists, there is a vast amount of material for the student who is interested in research in visual optics. J. I. K.

* * * * *

THE DOCTOR'S INCOME AND EXPENSE RECORD. Published by the Hill Publishing Company, Michigan City, Ind., 1932, $3.00.

The book entitled the "Doctor's Income and Expense Record" has been issued by the Hill Publishing Company with a view of giving the professional man a simplified bookkeeping system and relieve him of income tax worries. This book is the product of a Certified Public Accountant with a long experience of handling doctor's records and income tax.

The system is so arranged that for instance by looking at page 50 one is in a position at any time to learn (a) the amount of actual net income; (b) the amount of outside income; (c) comparison of income at any time with any other year. At the end of the year the doctor knows exactly what his financial standing is and has all the figures necessary for the income tax report. On page 49 one may find many items of expense which are deductible for income tax purposes and which are usually overlooked. J. I. K.

ANNOTATIONS
AND
SOCIETY PROCEEDINGS

The American Journal of Optometry is the Official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Indiana, Iowa, Maine, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont and West Virginia Optometric Associations.

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AMERICAN ACADEMY OF OPTOMETRY

The eleventh annual meeting of the American Academy of Optometry was held in Chicago the 18th, 19th and 20th of December. The first two days were given over to papers and reports, the third being spent at the Northern Illinois College of Optometry where papers and clinical demonstrations were given by the professors of the college.

Among the Academy members who presented papers were Dr. Wm. Feinbloom, Dr. E. LeRoy Ryer, Dr. O. J. Melvin, Dr. Carel C. Koch, Dr. Edwin Forbes Tait, Dr. J. I. Kurtz, Dr. R. M. Hall, Dr. Harry E. Pine, Dr. R. D. Paine, Dr. L. K. Wyatt, Dr. Charles Sheard, Dr. H. Riley Spitler, Dr. W. B. Needles and Dr. W. J. Heather. At the formal round table dinner Dr. O. J. Melvin of Omaha, Nebraska, was elected chairman for 1933. Dr. Melvin succeeds Dr. Walter I. Brown. A number of research fellows will be appointed during the coming year, these men all doing graduate work at various universities under the direction of the academy committee headed by Dr. Edwin Forbes Tait. The meeting place for 1933 will be announced later.

* * * * *

NEW ENGLAND COUNCIL

The New England council offers a highly constructive program to be held at the Hotel Statler, Boston, March 6, 7 and 8, 1933. During the months past the council has made a survey and study of the most urgent needs of its members and has selected and arranged a program designed to help its listeners solve many of their present day problems. The program includes much practical help. Clinical demonstrations, lectures on economics, office procedures, present

day theories, and other helpful material will be presented. The speakers are men of national reknown in their respective fields and an unusually large registration is expected. Members of other state associations will be welcomed; the registration fee is $10.00. The program summary follows:

Dr. Laurence P. Folsom, President of the Council, opening address, "Ethical Optometric Ideals"; Dr. Thomas McBurnie, Brooklyn, N. Y., President of the A. O. A., "Constructive Optometric Progress"; Dr. Charles Sheard, Mayo Clinic, Rochester, Minn., "Practical Points in Routine Ocular Refraction"; Dr. Theodore F. Klein and Staff, Massachusetts School of Optometry, Boston, "A Clinical Demonstration of Modern Optometric Technique"; Dr. Chester H. Johnson, Philadelphia, Pa., President of the International Association of Optometry Boards, "Practical Office Procedure"; Dr. Julius Neumueller, Philadelphia, Pa., "Present Day Theories in Optometry—What to Accept—What to Reject"; Dr. Charles Sheard, Rochester, Minn., "The Science and Art of Optometric Practice"; Prof. A. E. Kennelly, Harvard University, "Preventive Optometry and Correct Illumination for Seeing"; Dr. Charles A. Parenteau, Rochester, N. Y., "Retinal Sensitivity—The Part It Plays in Daily Optometric Practice"; Dr. Alaric J. Phaneuf, New Bedford, Mass., "Visual Field Charting for Optometrists"; and Mr. Ralph Barstow, Rochester, N. Y., a solution of the economic problems facing optometrists. Part 1, "Building Professional Progress and Good-Will." Part 2, "Personal and Patient Psychology."

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AMERICAN OPTOMETRIC ASSOCIATION

Dr. Thomas McBurnie, president of the American Optometric Association, has just issued a proclamation designating the entire week of February 5, 1933, as "Save Your Vision Week." It is suggested that talks on eye-conservation be made by optometrists at various public meetings during this week.

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SKEFFINGTON GRADUATE CLINICS

Dr. N. N. Binns, optometrist of Fort Worth, Texas, reports a most satisfactory clinical session held recently in that city by the director, Dr. A. M. Skeffington. Similar successful gatherings are reported by Dr. H. L. Bowers of Bay City, Mich., Dr. Roy Peterson of Minneapolis, Dr. E. C. Puff of Los Angeles, Dr. Bert C. Hersch of San Jose, Calif., Dr. M. H. Dearden of Salt Lake City and Dr. Joseph H. Salov of Newark, N. J.

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MAINE ANNUAL MEETING

The thirty-third annual meeting of the Maine Association of Optometrists will be held on January 11 at the Eastland Hotel at Portland. Five technical talks will be presented at this meeting.

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